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The role of the International Development Research Centre (IDRC) in strengthening agricultural and livestock research in and for the developing countries

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IDRC is one of the newest of the International Agencies concerned with agricultural research and development. The Centre was founded approximately four years ago largely at the instigation of the late Lester B. Pearson then Prime Minister of Canada and of Morris Strong, at that time President of the Canadian International Development Agency and now Executive Director of the UN Environment Program. The seeds of IDRC's origin appear to be associated with two important observations to be found in Mr. Pearson's report entitled "Partners for Development". The first of these relates to the observation that a very small amount of "research and development" funds were being allocated to the problems of the Third World. The second observation was that some of the most successful development activities that the Pearson Commission observed were those associated with the research programs of the Ford and Rockefeller Foundations which were able to concentrate on a long term basis on very specific problems and to do so in a way that was not inhibited by geographical or political constraints.

In 1970 when the Canadian Government was in the process of bringing about a substantial expansion in its Aid Program, it created IDRC as a Crown Corporation with the objective of "initiating, encouraging, supporting and conducting research into the problems of the Third World and into the means for applying and adopting scientific technical and other knowledge to the economic and social advancement of the developing regions".

The Centre is financed almost entirely by the Government of Canada but is operated independently and is governed by a Board of twenty-one members, ten of whom are non-Canadians. Additionally the senior program staff are about half Canadian and half non-Canadian. The Centre is organized into four program divisions covering the fields of agriculture, food and nutrition sciences, information sciences, social science and human resources and population and health sciences At the present time the largest program area is in the field of agriculture, food and nutrition.

As in most of the Centre's other programs the major part of the funding in the agricultural program is devoted to support for applied research in developing country institutions. The research program is heavily oriented towards building up the research capacities of indigenous institutions and to this end the Centre only provides a limited number of expatriate staff. Thus, at the present time, with an annual budget of about 7 million dollars a year for the agricultural program its staff consists of 7 senior and 6 junior professionals divided between Head Office, Regional Offices and International Agri-

cultural Research Centres and 16 technical advisors located in field projects. In all cases the technical advisors are provided on the condition that they work as members of the research team of the recipient institution. IDRC does not supply project managers or directors.

In developing this approach and in defining the activities of the agricultural program, we have tried to identify a role for IDRC which would not duplicate that of other International Organizations and which would not overlap with our sister Organization the Canadian International Development Agency (CIDA). In developing this philosophy we have focused very heavily on the International Agricultural Research Centres, since research is the raison d'être of our existence. We also recognize that being relatively small and new, provides us with a great deal more flexibility that many Organizations and that at the present stage of their growth this flexibility appears to be a particularly advantageous asset for collaborative programs with the International Centres.

In working with the International Centres we have been associated with three types of programs namely the core program of the Centres themselves, basic research in Canada to backstop the Centres and support for 'outreach' programs in the developing countries. Generally speaking we have not provided core budget support for the International Centres (except for enabling funds which we have been able to mobilize rapidly to help get the new Centres of ICRISAT, ILRAD and ILCA off the ground), although such support may be provided in the future. In the case of CIMMYT and CIAT, IDRC has man-

aged two major research programs, the greatest part of the funds for which were provided from CIDA's budget.

In the case of the CIMMYT program, Canadian support is specifically for Triticale research. The Canadian Institutional link is relatively straight forward since the University of Manitoba in Winnipeg had worked on Triticale for some years and they were already associated with CIMMYT in carrying out some of the basic breeding and cytogenetic work necessary for the CIMMYT program. Winnipeg is too cold for winter triticales so a related support program has also been developed at the University of Guelph for growing winter triticale. Thus Canadian Institutions are able to provide basic research support plus a winter testing station for the CIMMYT program which is already reaching out to a number of developing countries. To facilitate this outreach IDRC has supported Triticale research in several high altitude developing countries such as Chile and Ethiopia.

IDRC is also involved with a related activity in conjunction with ICRISAT, the semi-arid zone research Centre in India where the main commodity interests are grain legumes, millet and sorghum. From its own resources IDRC is financing ICRISAT's legume research program. In this area we are also involved in assisting local programs in a number of Asian, African and West Indian countries in addition to supporting basic research in Canada on the mechanism of drought resistance, which we hope will lead to a better understanding of this phenomenon in sorghum and millet. In the case of the

outreach program we do not provide expatriate advisors for those countries where there is adequate local professional input and where the main requirements are research expenses plus the opportunity for the researchers to visit with people working in related fields. In a number of African countries there is still a shortage of trained personnel, particularly in plant breeding, and in such circumstances we try to put in a young person at or about the Ph. D level who will work as member of the local team while local staff are away on training.

With CIAT in Colombia we have a program which closely parallels the Triticale one, in that we manage core budget and Canadian support funds granted by CIDA but we ourselves support outreach projects in Latin America, Africa and Asia.

The three programs that I have referred to above are amongst our biggest programs although we are also associated in programs with other International Centres and in programs that have no relation at all to the programs of the International Centres. In some cases our activities lie mid-way between these extremes. Dr. Howell has already referred to our involvements with EAVRO and with the University of Guelph in a Trypanosomiasis program which, later on, will relate to the basic research and outreach activities of ILRAD, when that Institution becomes fully functional. In the animal production field we are also involved in developing a research network relating to the utilization of tropical by-products and unconventional feeds

and in this context support programs involving the use of coffee pulp, sugar-cane by-products and cassava.

The theme of our approach is to develop research networks rather than a series of 'ad-hoc' projects. In this respect we put considerable effort into arranging small workshops of 15-25 developing countries' scientists who have common research interests. We believe that this type of meeting is often more productive than providing funding for people to go to large international meetings or for short courses in the developed countries. It is our experience that many developing country scientists trained overseas become highly frustrated when limited facilities are available to them in their own country. We believe that by providing some research funding to such scientists and by providing them with the opportunity to exchange experiences with personnel in similar circumstances we are able to help overcome some of these frustrations. We find it particularly fruitful to provide support for graduate assistants to carry out research in developing country projects since we feel that many developing country scientists have obtained their post graduate qualifications working on problems totally unrelated to the realities of their home country. This is sometimes due to selfishness on the part of developed country professors, but more often is attributable to funding limitations which curtail opportunities for carrying out home based research in the Third World. In an effort to overcome this problem an important part of our funding for research is channeled into providing support for developing country scientists to do research for higher degrees in

their own countries.

We have also encouraged those Canadian Institutions to which we are providing support, to use Third World graduate students in their programs and to try to orient the work of these students towards problems with which they will be confronted at home. One excellent example of this type of approach concerns a program at Guelph where the objective is to produce single cell protein from cassava. This program was requested by CIAT whose early efforts at microbiological enrichment of cassava were promising but lacked adequate equipment and specialists to carry them through to fruition.

At the University of Guelph, a program to support CIAT in this field has participants from the Departments of Microbiology, Nutrition, Animal Science and Agricultural Engineering. In each of these four Departments a foreign student from a developing country is working for an M. Sc. on the cassava project. The project has now identified an organism which raises the protein content of a raw cassava mash from 2% to 15% and the process does not require cooling or sterilization and utilizes a simple agitator fermentor. By the time that toxicity tests will have been completed this summer, a scaled up fermentor will have been built in Guelph and this will provide enough protein to feed 100 pigs daily. In October the fermentor will be shipped to CIAT for installation and during the next few months the technical input will be phased out from Guelph and handed over to CIAT and to a neighbouring Colombian University, which will provide technical advice in those

fields where CIAT does not possess appropriate expertise.

I would like to illustrate the cassava network further by using two animal-oriented problems. Both of these relate to the use of cassava as an animal feed. For several years Dr. J. M. Maner has been carrying out research in this field at CIAT. Maner's work has shown that cassava could provide a useful source of energy in livestock rations, particularly for swine, but that with high levels of cassava intake there was an impaired performance in terms of live weight gain. The literature on this theme is very incomplete but there are suggestions that the poor weight gains are due both to a deficiency of methionine in the cassava itself and also because the animal body selectively uses sulphur containing amino-acids, such as methionine, to detoxify the cyanogenic glucosides of cassava.

Maner's results highlighted two problems. The first was to identify whether cassava really could play a significant role as an animal feed in the future and the second to identify the significance of cyanide and methionine in cassava nutrition.

In order to handle the first problem we contracted with the Agricultural Economics Department of the University of Guelph for an experienced staff member to spend a year studying the global market prospects for cassava as both human and animal feed and also as a source of industrial starch. The scientist involved established excellent working relations with both the

export and the import sides of the trade and with international organizations such as OECD, EEC, FAO, IBRD and some bilateral agencies. At the end of a year's work he submitted a report to a workshop composed of members of the Agencies I have mentioned above and to the principal importing and exporting countries. Following the workshop's critical review, IDRC published a report which indicated that cassava appeared to have remarkable growth prospects as an animal feed. Indeed, during the last ten or twelve years Thailand and Indonesia have between them developed an export market in dried cassava chips and pellets which provides them with about $100 million a year of foreign exchange. The 2 million tons of dried chips and pellets which currently enter the European Common Market still only comprise a very small portion of that market's feed energy requirements.

The report that I have referred to looks at the growth potential of cassava in terms of both minimum costs and legal requirements for compound feeds, it indicates that as early as 1980 the EEC could be importing between 2 and 4 times as much cassava as it imported last year. If either of these figures comes to be realized, cassava will assume an importance in international trade much above that of some better known commodities. However, even more significant is the fact that much of the world's cassava production takes place in countries which have a large livestock population. These countries are generally protein deficient and some of them are importing cereal grains for livestock feed and exporting cassava at a considerably lower price, although

its value as a feed is only ten to twenty dollars a ton less than that of corn.

This price differential could become less and the value of cassava could become greater if some of the work on microbial production from cassava currently under way in Canada and in Malaysia were to bear fruit. The whole subject could also become vastly more attractive if the current research on cassava breeding and agronomy (two very neglected fields), were to lead to the production of higher yielding varieties which could lower both production costs and farm prices for cassava. Research to meet this goal is currently underway in an integrated program which includes activities in Latin America, Africa and Asia.

The second aspect of the animal feeding work that I would like to mention relates to the toxicity story. The literature on chronic cassava toxicity in man goes back only 40 years and only in the last 10 years or so have scientists in Nigeria and Zaire started to produce firm facts relating neurological and thyroid disorders in man to high cassava intakes. The neurological disorder appears to be a straightforward toxicity resulting in a demyelinization of the peripheral nerves. The thyroid problem looks like a secondary toxicity due to a blockage of the transfer of iodine in the thyroid due to thiocyanate (SCN) produced by the detoxification of cyanide by sulphur-containing amino acids such as methionine.

Although these problems do not appear to be of major importance in animals

fed on cassava diets, possibly due to the limited duration of such feeding, the whole subject is sufficiently uncertain that we wanted to review it in depth in terms of the postulated growth prospects for cassava as both a food and a feed. To this end we organized a small Workshop at which inputs were provided on the genetics and biosynthesis of cyanogenesis in plants, the agronomy and physiology of cyanogenic glucosides in plant tissues, the implications of cyanide toxicity in human and animal nutrition and the assay and detoxification of cyanides in the body.

As a result of this Workshop, which brought together researchers from as far apart as Colombia, Nigeria, Indonesia and New Zealand, we were able to define that it should be possible to produce plants of a very low cyanide content and that providing that this did not lead to major changes in the pest resistance of the plant nor to massive consumer rejection of processed cassava products, this would be a highly desirable attribute for human nutrition. However, from the animal feeding standpoint, because of the low methionine level in cassava, it would be safer to add methionine to cassava rations as a routine. From the standpoint of research policy this Workshop led to us supporting activities on the large scale screening of cassava plants for cyanide levels, on the improvement of assay techniques, on the evaluation as to whether chronic toxicity was really due to cyanides or to their glucoside precursors and to support a joint Belgium/Zaire program of applied research to reduce the incidence of congenital cretinism in children born to mothers on very high cassava diets in northern Zaire.

I have mentioned these examples in some detail because when you look at them and look at the distribution and disciplines of the participants in the two Workshops, which I have included as an appendix to this paper, you will get a better concept of what I mean when I talk of an interdisciplinary research network. I have dealt in depth with cassava since this is a program with which I have a particular familiarity. It has developed from scratch in the last three years and it illustrates particularly well the type of role that our Organization is trying to play.

Because we have a highly mobile senior staff scattered throughout the world and because of the excellent working relations which we have with the other International Agencies forming the Consultative Group for International Agricultural Research, and with the International Centres themselves, we believe that we are developing an effective internal information system which facilitates the establishment of the type of network that I have talked about. Obviously the success of any network of this type depends very largely on the degree of cooperation provided by both the participants and the donor agencies. Our experience has been that we could not have asked for better cooperation and we believe that the periodic Workshops that we hold to bring together people with related interests contributes considerably to this type of activity.

In 1970 when we started to negotiate our contracts with CIAT and CIDA, the total amount of funding flowing to cassava research appeared to be less than US$250,000 a year. The figure for this year will be about ten times that

amount of which about a third comes from the seed money that CIDA put into the CIAT/Canadian program. Within three years funds have started to flow to the program from a number of other members of the Consultative Group on International Agricultural Research (CGIAR). Apart from the funds themselves, even more encouraging is the fact that most of the donor agencies have gone out of their way to consult the ongoing programs and to relate to them so that at the present time there is considerable integration in research activities in this field. The existence of the CGIAR and the opportunities that it provides for inter-agency dialogue appear to have facilitated this approach.

I have dwelt at some length on cassava rather than on a specific Animal Production or Health theme, since I believe that we shall see an increasing amount of livestock research activities in the future approached from this type of interdisciplinary standpoint. The model that I have used for cassava appears to warrant further examination in the animal research field particularly in terms of specific subjects such as trypanosomiasis or in the better utilization of tropical by-products as animal feeds.

This type of approach appears particularly suitable for support by International Agencies and Centres whose senior staff are constantly on the move and have unique opportunities for identifying institutions and people who can contribute to effective problem oriented networks. Furthermore by the careful selection of institutions and people in developed countries, appropriate

back-stopping can often be provided in the most effective and economical way, providing that the research objectives are focussed on both the needs of the developing countries and the human and physical resources of the back-stopping institution.

APPENDIX 1

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